

## 7. Compressive Strength Test

The Inspector shall do the following:

- a. Make compression tests on cylinders to satisfy the minimum strength requirements.
- b. Make at least three cylinders from each day's pour and cure them in the same manner as the precast units.

**D. Materials Warranty**

## 1. Shipping

Do not ship or transport any unit to the installation site unless it bears the required markings, stated in Subsection 866.2.01.C.5.

## **Section 867—Epoxy Coated Reinforcement Strips**

**867.1 General Description**

Specifications for this work will be included elsewhere in the Contract.

## **Section 868—Bituminous Adhesive For Raised Pavement Markers**

**868.1 General Description**

This section includes the requirements for bituminous hot-melt adhesive used to place raised pavement markers.

**868.1.01 Related References****A. Standard Specifications**

Section 106—Certification of Materials

**B. Referenced Documents**

AASHTO	ASTM	
T 48	C 430	D 1856
T 49	D 70	D 2669
T 53	D 1754	D 2712
T 202	D 1796	D 3407

**868.2 Materials****868.2.01 Bituminous Adhesive****A. Requirements**

## 1. Adhesive

Use an adhesive made of asphaltic material and a homogeneously mixed filler that meets the following physical requirements:

- a. Adhesive Properties: Use the asphaltic material with filler.

	Min.	Max.	Test Method
Softening point	200° F (95 °C)	—	AASHTO T 53
Penetration, mm 3.5 oz (100 g), 5 sec., 77 °F (25 °C)	10	20	AASHTO T 49

	Min.	Max.	Test Method
Flow	—	0.2 in (5 mm)	ASTM D 3407 (modified in Subsection 868.2.01.C)
Viscosity, 400 °F (204 °C)	—	75 Poises (7.5 Pa-s)	ASTM D 2669 (modified in Subsection 868.2.01.C)
Flash point, C.O.C.	550 °F (285 °C)	—	AASHTO T 48

- b. Asphalt Properties: Use the filler-free material derived from the extraction and Abson recovery process explained in Subsection 868.2.01.C.

	Min.	Max.	Test Method
Penetration, mm 3.5 oz (100 g), 5 sec., 77 °F (25 °C)	25	—	AASHTO T 49
Viscosity, 275 °F (135 °C)	12 Poises (1.2 Pa-s)	—	AASHTO T 202
Viscosity ratio, 275 °F (135 °C)	—	2.2	See Subsection 868.2.01.C

- c. Filler Properties: Use the filler separation techniques described in Subsection 868.2.01.C.

	Min.	Max.	Test Method
Filler content, percent by weight	50	75	See Subsection 868.2.01.C
Filler fineness, percent passing			
No. 325 (45 µm)	75		ASTM C 430 (modified in Subsection 868.2.01.C)
No. 200 (75 µm)	95		
No. 100 (150 µm)	100		

- d. Certification: Submit a certification from the manufacturer that includes the physical properties of the bituminous adhesives and that the material conforms with this Specification, as stated in Subsection 106.05, “Materials Certification.”

## 2. Packaging and Labeling

- Pack the adhesive in a self-releasing cardboard container of approximately 10 in (250 mm) that can be stacked properly.
- Fill the containers with two 30 lb (13.5 kg) cubes that have a net weight of 60 lbs (27 kg).
- Put the manufacturer, quantity, and batch number on the label.
- Print “Bituminous Adhesive for Pavement Markers” on the label.

## B. Fabrication

General Provisions 101 through 150.

## C. Acceptance

### 1. Flow

Determine flow according to Section 6, Flow, of ASTM D 3407.

- Set the oven temperature at 158 ° ± 2 °F (70 ° ± 1 °C).
- Prepare samples according to Subsection 7.1 of AASHTO T 49.

## 2. Viscosity

Determine viscosity according to ASTM D 2669 using a spindle speed of 10 rpm.

- a. Heat the adhesive to approximately 410 °F (210 °C) and then let cool.
- b. Determine viscosity at  $400^{\circ} \pm 1^{\circ}\text{F}$  ( $204^{\circ} \pm 0.6^{\circ}\text{C}$ ).

## 3. Asphalt Properties

Determine the base asphalt properties based on the material obtained from the following extraction and Abson recovery methods:

- a. Extract the asphalt by heating the adhesive to the point where it will easily flow.
- b. Add 125 to 150 g of adhesive to 400 mL of trichloroethylene that has a temperature of 125 ° to 150 °F (51 ° to 66 °C).
- c. Stir the mixture to dissolve the asphalt.
- d. Decant the trichloroethylene-asphalt mixture.
- e. Recover the asphalt using the Abson recovery method described in ASTM D 1856, except do not use the extraction methods of ASTM D 2712, and do not filter the solvent-asphalt mixture.
- f. Centrifuge the extraction solution of trichloroethylene and asphalt for at least 30 minutes at 770 times gravity in a batch centrifuge.
- g. Decant the solution into a distillation flask. Do not include any filler sediment.
- h. Apply heat and bubble carbon dioxide slowly until the solution reaches a temperature of 300 °F (149 °C).
- i. Increase the carbon dioxide flow to between 800 to 900 mL per minute.
- j. Maintain the decanted solution temperature between 320 ° and 335 °F (160 ° and 168 °C) with this carbon dioxide flow for at least 20 minutes and until the trichloroethylene vapors are completely removed from the distillation flask.
- k. Repeat the extraction-recovery method as necessary to obtain the desired quantity of asphalt.
- l. Determine penetration, 275 °F (135 °C) viscosity, and viscosity ratio with the recovered asphalt.

## 4. Viscosity Ratio

Determine the 275 °F (135 °C) viscosity ratio by comparing the 275 °F (135 °C) viscosity on the base asphalt before and after the Thin-Film Oven Test.

- a. Perform the Thin-Film Oven Test as described in ASTM D 1754.
- b. Determine the specific gravity with a pycnometer as described in ASTM D 70 for use in the Thin-Film Oven Test.
- c. Calculate the 275 °F (135 °C) viscosity ratio by dividing the viscosity after the Thin-Film Oven Test by the original 275 °F (135 °C) viscosity.

## 5. Filler Material

Separate the filler material from the asphalt to determine filler content and filler fineness.

## a. Filler Content

- 1) Determine the portion by weight of the adhesive that is insoluble in 1, 1, 1-trichloroethane by weighing  $10.00 \pm 0.01$  g of solid adhesive into a centrifuge flask with a volume of approximately 100 mL, as specified in ASTM D 1796.
- 2) Add 50 mL of 1, 1, 1-trichloroethane to the adhesive.
- 3) Break the adhesive into small pieces to dissolve the solids.
- 4) Place the sample flask in a balanced centrifuge and spin with a minimum relative centrifugal force of 150 (as determined in Section 6 of ASTM D 1796) for 10 minutes.
- 5) Remove the sample flask and decant the solvent, without losing any solids.
- 6) Repeat the application of solvent and centrifuging until the solvent is clear and the filler is visually free of asphalt.
- 7) Dry the filler at  $160^{\circ}, \pm 5^{\circ}\text{F}$  ( $71^{\circ}, \pm 3^{\circ}\text{C}$ ) to remove solvent and weigh the resulting filler.
- 8) Filter the decanted solvent to verify that no filler was lost.

- 9) Calculate the percent filler content as follows:

$$\text{Filler Content, \% by weight (g)} = \frac{\text{Filler Wt. (g)} \times 100}{\text{Original Adhesive Wt. (g)}}$$

b. Filler Fineness

- 1) Determine filler fineness according to ASTM C 430, using No. 325 (45 µm), No. 200 (75 µm), and No. 100 (150 µm) sieves.
- 2) Modify this method by using a water-soluble, non-ionic wetting agent, such as Triton X-100, to aid the wetting action. Use a surfactant solution that is approximately 1 percent by weight.
- 3) Thoroughly wet the 1-gram dry sample in the surfactant solution.
- 4) Soak the sample for 30 minutes.
- 5) Transfer the filler to the sieve cup.
- 6) Spray water on the filler for two minutes.
- 7) Add surfactant solution as needed and physically disperse clumped particles.
- 8) Dry the sample and handle as directed in ASTM C 430.

The Department will reject any bituminous adhesive if it meets all requirements of this Specification but fails in actual use.

**D. Materials Warranty**

General Provisions 101 through 150.

## **Section 870—Paint**

### **870.1 General Description**

This section includes the requirements for all paints, including pigments, vehicles, and the compositions of prepared paints for all purposes specified.

#### **870.1.01 Related References**

**A. Standard Specifications**

General Provisions 101 through 150

**B. Referenced Documents**

QPL 46

SOP 14

AASHTO M 69

Military Specifications MIL-E-698 B

MIL-P-23236 or US Corps of Engineers Specification C-200

Federal Test Methods, Standard No. 141

Federal Specifications		ASTM			
TT-E-489	TT-P-791a	D 209	D 476	D 768	D 3021
TT-P-103b	TT-P-1952B	D 211	D 600	D 822	D 3721
TT-P-104b	TT-R-266	D 234	D 602	D 1199	D 4462
TT-P-320c	TT-T-291	D 235	D 604	D 1648	E 97
TT-P-460	TT-V-119	D 263	D 605	D 2805	G 23
		D 324	D 711		